About this manual...

This manual contains the Installation and Maintenance information for the PU9600 FTIR Spectrometer and the two alternative configurations.

The manual contains instructions for preparing and installing the system. It also includes sections on installing a printer and plotter for either configuration. If a complete system is purchased from Philips, then much of the installation work on the computer will already have been done although you can check this using the information in this manual.

Your attention is drawn to Section 1 which includes information on safety and in particular to laser safety. You should also familiarise yourself with the care of floppy disks and the precautions to take before moving the computer.

PU9600 FTIR SPECTROMETER
INSTALLATION AND MAINTENANCE MANUAL

CONTENTS

SECTION 8 – PU9600 MAINTENANCE

SECTION 9 – PERFORMANCE TESTS

SECTION 1 - SAFETY

Read this section carefully before installing and using the instrument and its accessories.

The safety requirements in this manual comply with the requirements of the HEALTH AND SAFETY AT WORK ACT 1974.

1.1 Introduction

The instrument and accessories described in this manual are designed to be used by properly trained personnel only. Adjustment, maintenance and repair of exposed equipment must be carried out only by qualified personnel who are aware of the hazards involved.

In order to ensure safe and efficient operation of the instrument, the instructions given in this, and any related manual, must be strictly adhered to.

1.2 Safety Precautions

For the correct and safe use of this instrument and its accessories, it is essential that both operating and servicing personnel follow generally accepted safety procedures in addition to the safety precautions specified in this manual.

Specific warnings and cautions statements, where applicable, can be found throughout the manual. Warning and caution statements and/or symbols are marked on the equipment where necessary.

The instrument cover should only be removed by personnel who have been trained to avoid the risk of electrical shocks. The mains electricity supply to the instrument must be disconnected and at least three minutes allowed for capacitors to discharge.

Some of the chemicals used in spectrophotometry are corrosive, and/or flammable and samples may be radioactive, toxic or potentially infective. Care should be taken to follow the normal laboratory procedures for handling chemicals.

1.3 Caution and Warning Statements

Caution: **Used to indicate correct operating or maintenance procedures in order to prevent damage to, or destruction of, equipment or other property.**

WARNING: Indicates a potential danger that requires correct procedures or practices in order to prevent personal injury.

1.4 Impaired Safety Protection

Whenever it is likely that safety protection has been impaired, the instrument or accessory must be made inoperative and secured against any unintended

operation. The matter should then be referred to the appropriate servicing authority.

Safety protection is likely to be impaired, if for example, any instrument fails to perform its intended function or shows visible damage.

1.5 Explanation of Symbols

To protect the instrument from damage the operator must refer to an explanation in the Operating Manual.

(yellow/black)

Laser radiation. Refer to an explanation in Section 1.6 below.

(yellow/black)

1.6 Laser Safety

1.6.1 Introduction

The following describes the laser safety requirements for the PU9600 Series Spectrometers and associated accessories. The optics in these products use one helium/neon (HeNe) laser.

1.6.2 Description

Provided the instrument cover is in place all of the PU9600 Series spectrometers are Class II laser products, which means the laser radiation levels accessible during operation are below the Class II limits as defined by British Standards BS7192 (IEC825).

All persons using, or in the vicinity of, a laser should be aware of the potential hazards.

WARNING: Never stare directly into the laser beam.

Please contact a Philips Analytical Service Engineer for any service required on the laser.

WARNING: Do not alter or attempt to remove the laser head from its protective housing. Exposure to possible radiation or high voltage may result.

The source of laser energy in your spectrometer is a nominal 2/maximum 4 milliwatt, continuous 632.8 nm laser head. In Philips Analytical spectrometers, the laser light is reduced as it passes through the beamsplitter and other parts of the spectrometer optics. Less than 20% of the laser light is transmitted to the sample compartment.

WARNING: Use of controls or adjustments of performance or procedures other than those specified in this manual may result in hazardous radiation exposure.

1.6.3 Manual Conventions

Throughout this manual the terms operating, maintenance and service are used and defined as:-

Operating

Operating refers to the procedures or functions used to run the system, including turning on the system, entering commands and parameters, and running programs. Operating procedures or functions specified in this manual are to be performed by you.

Maintenance

Maintenance refers to the periodic "house cleaning" of the system to keep it operating efficiently. Maintenance procedures can include cleaning the floppy disk unit, replacing the desiccant, maintaining the software and tuning the beamsplitter. Maintenance adjustments or procedures specified in this manual are to be performed by you.

Service

Service refers to any adjustments or procedures required to correct a hardware or software malfunction. Service functions specified in this manual are to be performed by a Philips Service Engineer or a Philips certified individual.

1.6.4 Protective Housings

A protective housing covers the entire optics bench for protection against exposure to the laser light. For proper spectrometer operation, the protective cover must be in place at all times.

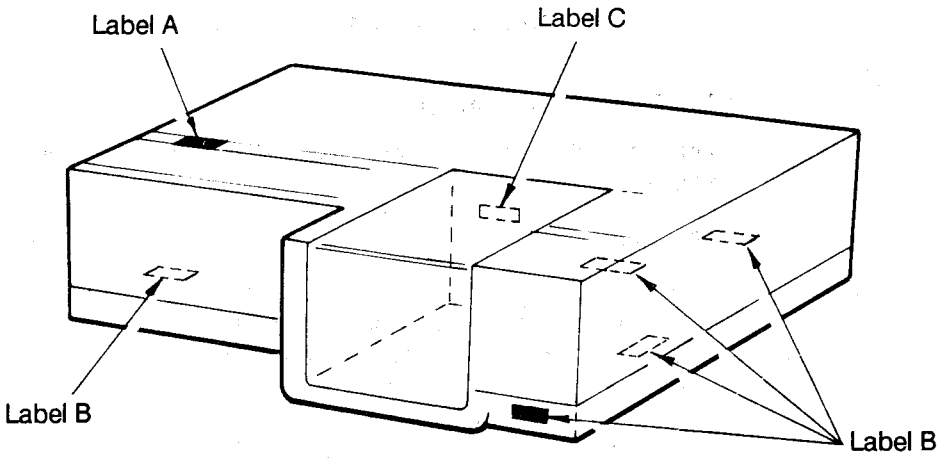
Open the sample compartment only for operation or maintenance. Access to the sample compartment should be as brief as possible in order to maintain the stability of the detector.

WARNING: Open the optical bench housing ONLY for:
(1) Removing the transit packing (or replacing for transit)
(2) Renewing the Silica Gel desiccant.

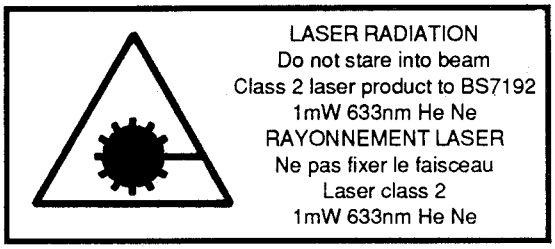
The accessible laser radiation in the sample compartment is very low, less than 20% of the original laser energy. However, since you must access the sample compartment for general operation, the spectrometers and auxiliary modules must be classified as Class II laser products.

1.6.5 Labelling Requirements

Various warning labels concerned with laser radiation are affixed as shown in Fig 1.1.

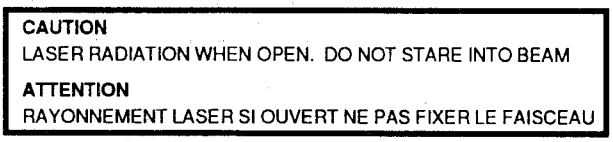


Label A



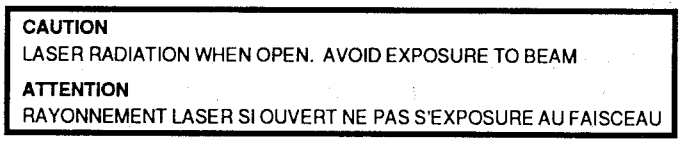
Part No. 4013 161 79490

Label B



Part No. 4013 161 79510

Label C



Part No. 4013 161 79500

Fig 1.1 Warning labels and their locations

1.6.6 Laser Information

The source of laser energy in your PU9600 Series spectrometer is a minimum 2, maximum 4 milliwatt, continuous 632.8 nm laser head. Following is technical information on the laser:

Wavelength	632.8nm
Minimum Power	2.0 mW (TEMoo)
Maximum Power	4.0 mW
Beam Diameter	0.59mm($1/e^2$)
Beam Divergence	1.3 mrad
Spacing C/2L	685 MHz
Operating Voltage	1800 Vdc ±100 Vdc

SECTION 2 – SYSTEM DESCRIPTION

2.1 System Composition

The equipment forming the PU9600 system comprises the following major items:

- A PU9600 Series FTIR Spectrophotometer
- Computer and SWIFT–IR software OR
  Local Control Panel
- One of four printers (optional)
- One of two plotters (optional)

There are two basic versions of the spectrometer. One version requires the use of a personal computer with SWIFT-IR software, operating as a data station to provide the control facility. The second version is fitted with a Local Control panel. Different models of each version are available according to wavelength range, and mains voltage.

The data station verson is supplied fully configured and tested with the SWIFT–IR software installed and ready for use; various Philips computers are supported (see Section 2.3.1).

2.2 PU9600 Series FTIR Spectrophotometer

2.2.1 List of Models

Model	Item	Lower Wavenumber	Nominal Voltage	Part Number
Local Control	Optical Bench	200cm^{-1}	240V	9423 296 22151
Local Control	Optical Bench	200cm^{-1}	110V	9423 296 22161
Local Control	Optical Bench	400cm^{-1}	240V	9423 296 24151
Local Control	Optical Bench	400cm^{-1}	110V	9423 296 24161
Data Station	Optical Bench	200cm^{-1}	240V	9423 296 22551
Data Station	Optical Bench	200cm^{-1}	110V	9423 296 22561
Data Station	Optical Bench	400cm^{-1}	240V	9423 296 24551
Data Station	Optical Bench	400cm^{-1}	110V	9423 296 24561

2.2.2 Specification

Mode of Operation:	Single beam FTIR with sealed and desiccated optics. Double Beam mode when Sample Shuttle accessory is used.
Purging:	Optional.
Detector:	IR pyro–electric. DTGS
Sample Compartment:	Integral with transparent cover and provision for fitting range of accessories listed in Section 2.5.

Wavenumber range:	7000 to 360 cm^{-1} extendable to 200 cm^{-1} (See Section 2.2.1)
Nominal Resolution:	Better than 1.5 cm^{-1}.
Baseline Flatness:	Less than ±1% deviation from 100% line (fully stabilised) over the range 5000 to 400 cm^{-1}
Wavenumber Accuracy:	Within ±0.1% cm^{-1} from 5000 to 400 cm^{-1} and within ±0.5% cm^{-1} over whole range.
Wavenumber Repeatability:	Within ±0.01% cm^{-1} from 5000 to 400 cm^{-1} and within 0.05% cm^{-1} over whole range.
% Transmission Linearity:	At 0%T, within ±0.2% T from 0.2% T to 100% T over the range 5000 to 400 cm^{-1}.
Noise on 100% T line (rms):	
At 2100 cm^{-1}	3000:1 or better
Instrument Dimensions and Weight:	
Width:	774 mm.
Depth:	619 mm.
Height:	210 mm.
Weight:	33 kg (typical).

Maximum Radio Interference

This apparatus satisfies the requirement of EEC Council Directive No. 82/499/EEC on radio interference in that it conforms to BS800:1983.

Electrical Safety Class

This apparatus has been designed and tested in accordance with Safety Class 1 Requirements of IEC Publication No.348, Safety Requirements for Electronic and Measuring Apparatus and has been supplied in a safe condition. The present instruction manual contains some information and warnings which have to be followed by the user to ensure safe operation and retain the apparatus in a safe condition. The apparatus has been designed for indoor use.

2.3 System Equipment

The system comprises the following major items:

PU9600 Spectrometer
fitted with Local Control Panel (Local Control Version)
OR with Data Station comprising:
- Philips Personal Computer (see Section 2.3.1)
- Microsoft MS–DOS version 3.21 or later
- SWIFT–IR software

Printer (optional)
- Epson FX800 or FX850 dot matrix printer
- Hewlett Packard Paintjet 3630A printer (for Local Control version only)
- Hewlett Packard Laserjet II laser printer

Plotter (optional)
- Philips PPG3160/10 colour plotter (for Data Station version only)
- Hewlett Packard Colourpro 7440A plotter

Note: Depending on the configuration supplied, the printer may be connected to either the parallel interface on the computer (Data Station version) or to the serial interface on the PU9600 (Local Control version). For further details see Section 5.

2.3.1 Supported Computers

Philips Analytical cannot guarantee nor support the SWIFT–IR software for use on any computer other than an approved model.

Due to the rapid rate of technological improvement, Philips Analytical update their list of approved computers and disk operating systems from time to time. Please contact your local Philips Analytical Sales Office (or agents) for further information on currently approved computers.

2.4 Care of Flexible Disks

The flexible disks used with this system are fragile and the data they contain may be expensive to reproduce if lost. The following precautions are therefore recommended to maximise data protection:

(a) NEVER BEND OR FOLD A DISK. A disk can be creased very easily and this renders it useless.

(b) ALWAYS KEEP DISKS IN THEIR PROTECTIVE ENVELOPE or holder when not in use to prevent dust and dirt particles contaminating the disk surface.

(c) NEVER WRITE ON THE PROTECTIVE JACKET. Use one of the adhesive labels supplied and write on the label before appending it to the jacket.

(d) KEEP CIGARETTE ASH AWAY FROM DISKS. It is advisable not to smoke when using the disk system.

(e) NEVER TOUCH THE EXPOSED PART OF THE DISK. Always hold the disk by the jacket.

(f) DO NOT PLACE DISK IN BRIGHT SUNLIGHT OR STORE IT CLOSE TO A HEATER.

(g) KEEP DISK AWAY FROM MAGNETIC FIELDS e.g. telephone, X-ray equipment, microwave ovens, photocopier etc.

(h) STORE IN A WARM, DRY ROOM OR CUPBOARD IN A TEMPERATURE RANGE OF 10 TO 42°C.

(j) NEVER PUT PAPER CLIPS ON THE JACKET EDGE.

(k) PACK DISKS SECURELY WHEN SENDING BY POST. Place the disk between stiff cards and mark the pack 'DO NOT BEND'.

(l) DO NOT SWITCH OFF the computer with a floppy disk in the disk drive and the drive door shut.

(m) MAKE REGULAR BACKUP COPIES of data files from your hard disk on to floppy disks in case of hard disk failure.

2.5 System Accessories

The following accessories are available for use with the PU9600 Spectrometer. Details of the accessories and their installation are given in the accessory manual.

Description	Part Number
Diffuse Reflectance Accessories:	
Diffuse reflectance (research)	9423 257 17961
Diffuse reflectance (routine)	9423 257 17841
Baseline diffuse reflectance	9423 257 17811
Attenuated Total Reflectance (ATR) Accessories:	
Horizontal ATR (research)	9423 257 18011
Overhead ATR (routine)	9423 257 18031
Specaclamp (routine)	9423 257 18111
Baseline HATR	9423 257 17801
Ten reflection ATR	9423 257 13881
Circle cell (macrosample boat)	9423 257 17881
Circle cell (macrosample boat)	9423 257 17891
Square column	9423 257 03101
Specular Reflectance Accessories:	
Variable angle specular reflectance (15 – 65°)	9423 257 19001
Baseline specular reflectance (30°)	9423 257 17821
Grazing angle accessory (80°)	9423 257 17931
Gas Cells:	
Pyrex gas cells (10cm):	
NaCl windows	9423 257 13471
KBR windows	9423 257 13481
Liquid Sampling:	
Semi–permanent cells	See accessories brochure
Variable pathlength cells	See accessories brochure
Mull cell	See accessories brochure
Solid Sampling:	
Evacuable die	9423 257 05161
Disc holder	9423 257 13901
Plastic film press	See accessories brochure

Sample Compartment Microscopes:	
Microscope (115v)	9423 296 97071
Microscope (230V)	9423 296 97091
Removeable Sample Compartment Baseplate	9423 296 88901
Sample Shuttle	9423 296 89001
Air Driers:	
Air drier (230V)	9423 257 23071
Air drier (115V)	9423 257 23081
Spare Installation and Maintenance manual	9499 230 19011

SECTION 3 - OPTICAL BENCH INSTALLATION

Caution: **The Optical Bench includes a pack of Silica Gel desiccant which protects precision hygroscopic optical components contained within the unit. These may be irreversibly damaged by a moist environment. Allow at least one hour for the unit to reach room temperature before removing the sealed wrapper. See Section 3.4.1 for further details.**

3.1 Introduction

This Section describes the installation of the Optical Bench whether the Data Station or Local Control version has been supplied. The procedure is the same for either, the only difference being that a control panel (see Fig 3.1) is fitted to the Local Control version.

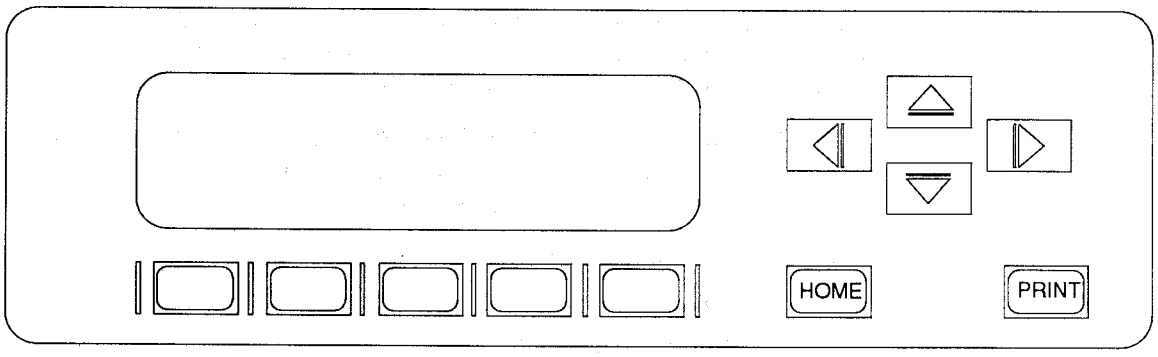


Fig 3.1 Local control panel

3.2 Initial Inspection

Check the contents of the shipment against the delivery note received with the equipment for completeness and possible transport damage.

If the contents are incomplete, or damaged, a claim should be filed with the carrier immediately. The nearest Philips Sales Organisation (or Agents) should also be notified of any damage and of any items not supplied in order to facilitate repair or replacement.

3.3 Location

The instrument is designed for use on a normal desk or bench. The mounting surface must be level and the instrument must not be placed on any type of cushioning as this could block ventilation.

Instrument dimensions and weight:

Width:	774mm.
Depth:	619mm.
Height:	210mm.
Weight:	33kg.

When siting the system, consider the environment in which the equipment is to be used. Some of the factors that may adversely affect the operation of the system are given below. However, the list cannot be exhaustive and some personal judgement may be necessary for a given set of circumstances.

(a) Static Electricity can permanently damage electronic components.

Electronic components do not necessarily have to be directly exposed to static electricity for damage to occur. For instance, an external static charge may be conducted through the pins of an unused, exposed connector to damage internal components. Avoid non-conducting carpets in the area surrounding the spectrometer. Anti-static mats, if large enough, can be placed over conventional carpeting. Man made fibres and some plastics used in chairs etc., can build up large potentials. Avoid locating the spectrometer system close to equipment capable of generating a magnetic field e.g. generators, television sets, radiological equipment etc.

(b) Infra-red spectrometers are sensitive to changes in temperature.

A temperature of between 5 and 40°C (41 to 104°F) should always be maintained, and for optimum system performance during operation, the temperature should vary less than 2°C (3.6°F).

Avoid large windows in the area of the spectrometer. Even when curtained there is a risk of heating by the 'greenhouse' effect during the day and of significant heat loss through the glass at night.

(c) Excessive vibration will adversely affect the quality of spectra obtained from the system.

Floor vibration caused by air conditioning or refrigeration units etc., or loud acoustical noise from heavy manufacturing plant can seriously affect the performance of the system. Minimise this situation wherever possible.

(d) Infra-red beamsplitters are hygroscopic and are damaged by moisture

The PU9600 has sealed and desiccated optics which can become irreversibly opaque when exposed to moisture. Ensure the Silica Gel desiccant is regularly checked and replace where necessary (see Section 8.2.2). Other bench components may also be damaged or corroded by moisture. Maintain the humidity in the range of 20 to 80% non-condensing.

(e) The environment must be free of dust.

Although the 'Background' procedure will counteract normal atmospheric dust levels, as with all computerised equipment, the system should not be operated or stored in an area of excessive dust generation.

3.4 Removal of Instrument Packing

3.4.1 Special Precautions

The optical section of the instrument is normally sealed against the ingress of moisture. This protection is removed under the following circumstances:

(a) The cover is removed.

(b) The desiccant is exhausted.

(c) The moisture level window indicator on the right hand wall of the Sample Compartment is removed.

(d) The plugs allowing the adjustment of the optics are removed.

After carrying out any procedure which involves any of (a) to (d), ensure the instrument optical protection is restored immediately the procedure has been completed.

3.4.2 Removing the Internal Packing

WARNING: Do not connect power to the instrument before removing the internal packing.

Before carrying out this procedure, lift the sample compartment lid and check the colour of the desiccant window on the right hand wall of the compartment. If this is blue you can continue with the following procedure. However, if the window is pink, the Silica Gel desiccant is exhausted. In this case, contact Philips Analytical or authorised agents for instructions before proceding any further.

(a) If fitted, remove the mains power connector and the serial cable connector from the socket on the rear of the instrument.

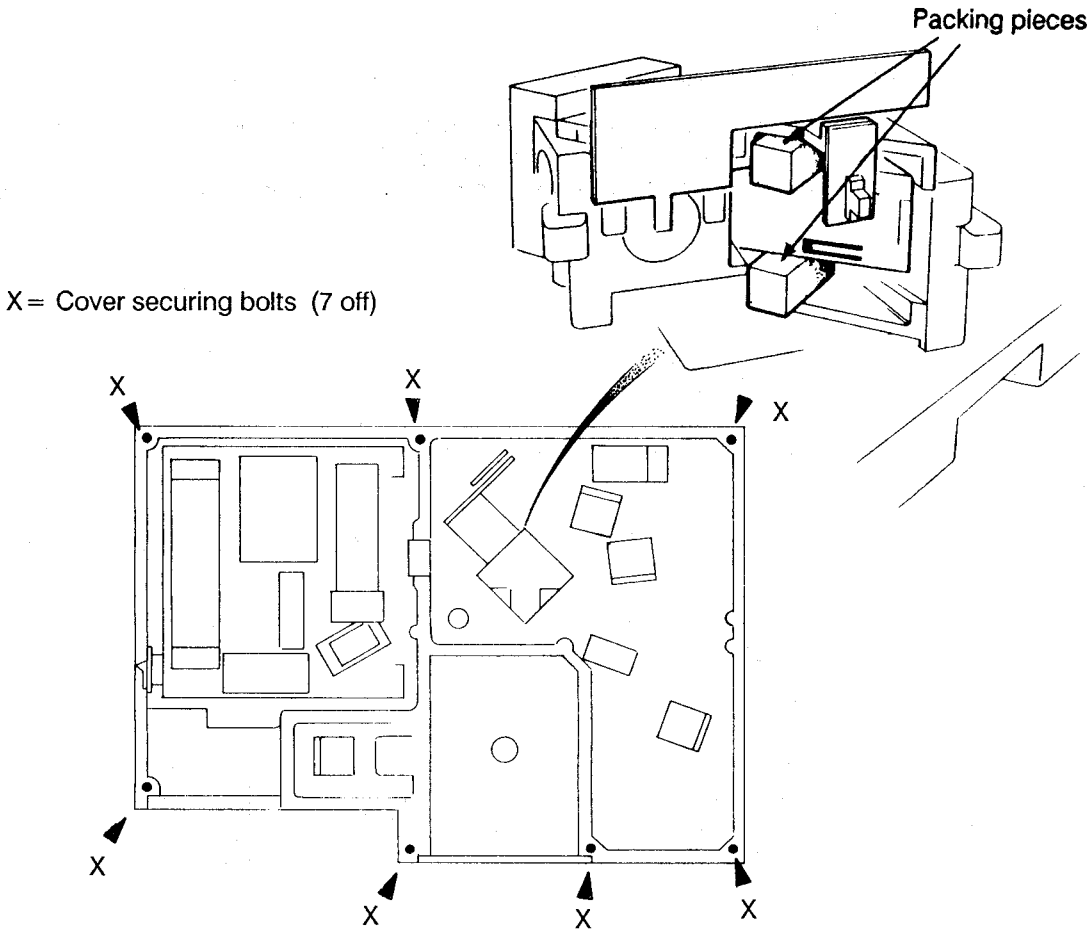


Fig 3.2 Cover and packing piece removal

(b) Carefully pull the front of the Optical Bench forward so the front overhangs the desk on which it is sited. Using the hexagonal wrench supplied, remove the four cover securing bolts from the underside of the instrument (Fig 3.2). Turn the instrument around and repeat, removing the three hexagonal bolts securing the rear of the instrument cover to its base. Carefully lift the cover directly upwards and clear of the base.

(c) Locate and remove the two packing pieces restraining the rocker arm of the interferometer assembly (Fig 3.2).

(d) Replace the cover and secure with the seven bolts removed during operation (b).

3.4.3 Preparing the Sample Compartment

(a) Unpack the sample compartment base plate and insert into the sample compartment (see Fig 3.3).

(b) Unpack the Sample Carrier and, using the M4 screws and hexagonal wrench supplied, fit the carrier to the threaded holes two in from the right hand edge of the base plate (see Fig 3.3). To align the Sample Carrier, refer to Section 8.4.

3.5 Connection to Mains

3.5.1 Earthing (Grounding)

Before making connections, the spectrometer must be connected to a protective earth conductor via the three core mains cable supplied (see Section 3.5.3). The mains plug must only be inserted into a socket outlet provided with a protective

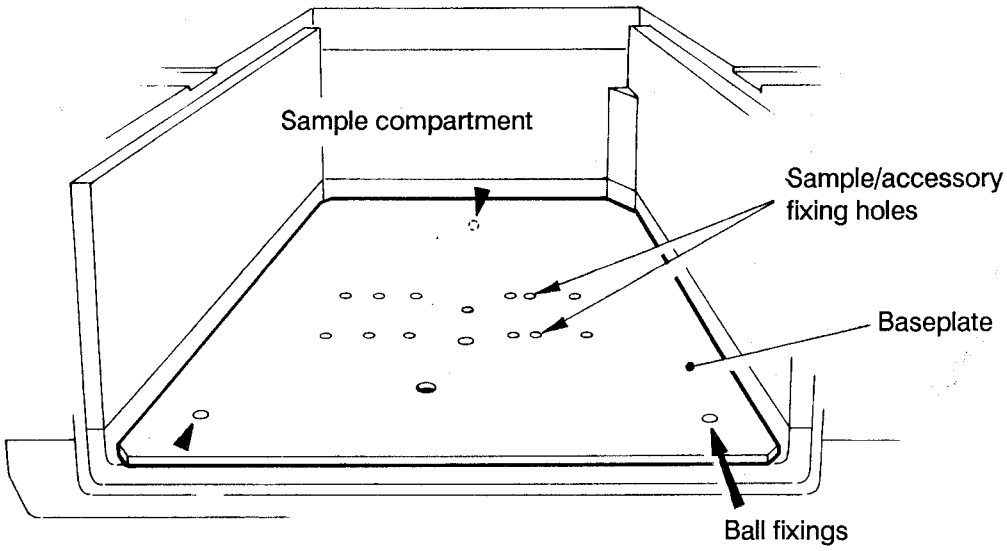


Fig 3.3 Sample carrier installation

earth contact. This protective action must not be negated by the use of an extension cable without a protective conductor.

WARNING: Any interruption of the protective conductor either inside or outside the instrument is likely to make the instrument dangerous. Deliberate interruption of the earth connection is prohibited.

3.5.2 Mains Voltage and Mains Fuse

The PU9600 is supplied in 220/240V and 110/120V versions. Check that your system is suitable for the local mains supply. It is not possible for the user to alter the mains voltage setting of the instrument. Should this become necessary for any reason, contact your local Philips Sales Organisation (or Agent).

The mains power supply should be fused at FS1 on the rear panel as follows:

Fuse Mains Voltage	Rating	Part Number
220/240V (50Hz)	1.6A (T)	2422 086 01451
110/120V (60Hz)	3.0A (T)	2422 086 01433

Ensure that only fuses of the required current rating are used for renewal. The use of repaired fuses, and/or the short circuiting of fuse holders is prohibited.

In the event of a replacement fuse failing, it should always be assumed that the equipment has an electrical fault and no attempt should be made to operate the system until it has been certified serviceable by a competent service engineer.

3.5.3 Mains Cable Connection

If you have been supplied with a mains cable with no plug fitted, or if the fitted plug is unsuitable, refer to operation (a) and connect a suitable plug. When fitted, carry out operation (b). If the mains cable has been supplied with a suitable plug fitted, carry out operation (b).

(a) Fit a suitable 3-pin plug to the free end of the cable, connecting individual leads as follows:

Plug Pins	Europe	N.America
Live (L)	Brown	Black
Neutral (N)	Blue	White
Earth/Ground (E)	Green/Yellow	Green

A good earth is essential for the satisfactory operation of the instrument and the safety of the user.

(b) Make sure the power ON/OFF switch on the right side of the unit is in the OFF position. Plug the mains cable into the POWER socket at the rear of the instrument (Fig 3.4).

Caution: Do not switch on mains power to the Optical Bench until the whole system has been interconnected as detailed in Section 7.

3.6 Instrument Connections

For details of the instrument system connections refer to Section 7.

3.7 Preparing the Instrument for Operation

3.7.1 Purging the Instrument

It is not necessary to purge the PU9600 except for use below 400cm^{-1}. However, if purging is required or thought to be necessary, Philips Analytical recommend that the Sample Compartment/Detector Section of each system is purged with dry air or nitrogen. Although not essential, a facility is also provided which enables the Interferometer to be purged. Refer to the dry air unit manual for operating instructions.

Nitrogen or dry air at a flowrate of 14 l/min with a –70°C dewpoint is required to purge the Sample Compartment/Detector Section. If the Sample Compartment is opened after purging and lets in water vapour, then these settings give a recovery time of 5 minutes.

Using the air hoses supplied with the dry air unit, connect the right hand air inlet at the rear of the instrument to the dry air unit (see Fig 3.4). Set the dry air unit for a flow rate of 14 l/min and dewpoint temperature of –70°C and switch on. Allow approximately half an hour for the sample compartment to be purged.

To purge the interferometer, connect the air hose from the dry air unit to the left hand air inlet at the rear of the instrument (see Fig 3.4); the dry air unit settings are the same as for purging the Sample Compartment/Detector Section.

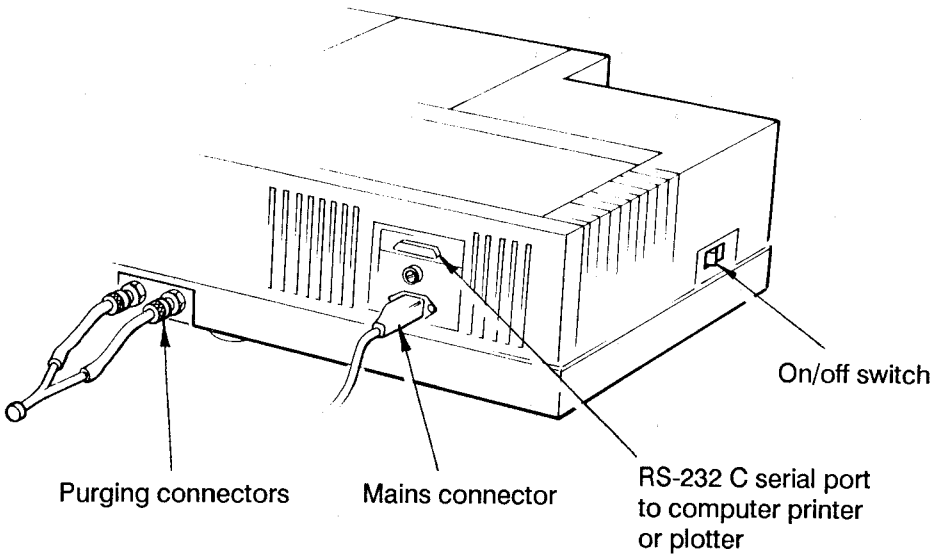


Fig 3.4 Connections to optical bench

3.8 System Setting Up

Before operating the instrument, of either configuration, some setting up is required.

The setting up required is in three parts. The first sets the serial data parameters (Data Station version) or selects a printer or plotter (Local Control version); the second part sets the Beamsplitter alignment and the third aligns the sample carrier.

Note: For details of adjusting the beamsplitter and aligning the sample carrier, refer to Sections 8.3 and 8.4 respectively.

3.8.1 Setting the Serial Parameters (Data Station version)

Where the system is a Data Station version, the computer serial parameters must match those set on the plotter DIP switches (if a plotter is to be used). The parameters required are as follows:

Baud rate:	9600
Parity:	None
Data:	8 bits
Stop bit:	1 bit

Note: Before carrying out these procedures, ensure the system is fully connected as described in the preceding Sections of this manual.

(a) Switch on the instrument, the computer and monitor. Allow the SWIFT–IR software to load.

(b) If the computer is already switched on but the SWIFT–IR software is not loaded:

type: FTIR

and press RETURN (↵).

(c) When the software has loaded, the HOME page is displayed.

(d) From the HOME page, press <F2> SERIAL PORT to access the SERIAL PORT page.

(e) Using the up/down cursor keys (↑ or ↓), highlight the parameter to be set and press RETURN. A pop-up appears giving the options available. Using the up/down cursor keys select the value required and press RETURN.

(f) Repeat for all parameters to be entered.

(g) To save the parameters set, press <F8> SAVE VALUES.

(h) Either press <F5> HOME or use the cursor up/down keys to place the cursor on the grey command line:

type: HOME

and press RETURN (↵) to return to the HOME page.

3.8.2 Selecting the Printer or Plotter (Local Control version)

Note: Before carrying out the following procedures, ensure the system is fully connected as described in the preceding Sections of this manual.

A Local Control version of the PU9600 can only have one printer or plotter connected and this must have a serial interface adapter fitted. To match the serial parameters of the Optical Bench the printer or plotter DIP switches **must** be set as shown in the appropriate section (Section 5 – Printer Installation or Section 6 – Plotter Installation). The serial parameters for the HP Laserjet II must be set via the printer control panel to those indicated in Section 5; refer to the printer manual for the procedure.

To select the Local Control printer or plotter, proceed as follows:

(a) Switch on the Optical Bench and the printer or plotter. The HOME page appears on the Local Control panel together with a series of legends above the five keys at the bottom of the panel.

(b) Press the key beneath the INSTALL legend to display the INSTALL page. On initially switching the system on, the default device (Epson FX850) is selected; at any other time, the previously selected device is indicated.

(c) To change the printer or plotter, press the key beneath the legend SELECT PRINTER. The output device indicated on the Local Control Panel display cycles through the printers and plotters available. Three printers are indicated whilst only one plotter is indicated. To select the supported plotter, i.e the HP Colorpro 7440A, select HPGL Plotter on the Local Control Panel; to select the FX800 printer, select FX850. The output devices indicated on the Local Control Panel are as follows:

Epson FX850
HPGL Plotter
HP PaintJet
HP LaserJet II

Note: For further details on the supported printers and plotters refer to Sections 6 and 7.

(d) When the required device is indicated, press HOME to return to the HOME page. The required printer or plotter is now selected.

SECTION 4 – COMPUTER INSTALLATION

4.1 Introduction

This section describes the installation of a fully configured Philips personal computer supplied with the Data Station version of the PU9600 Spectrometer.

Philips Analytical cannot guarantee nor support the SWIFT–IR software for use on any computer other than an approved model.

Due to the rapid rate of technological improvement, Philips Analytical update their list of approved computers and disk operating systems from time to time. Please contact your local Philips Analytical Sales Office (or agents) for further information on currently approved computers.

Each computer comprises the following major items:

Base Unit
Keyboard
Monitor
Mouse (optional)

4.2 Preparation

4.2.1 Initial Inspection

Check the contents of the shipment against the delivery note received with the equipment for completeness and possible transport damage.

If the contents are incomplete or damaged, a claim should be filed with the carrier immediately. The nearest Philips Analytical Sales Organisation (or Agents) should also be notified of any damage and/or items not supplied in order to facilitate repair or replacement.

4.2.2 Operating Conditions

The Data Station computer is designed for use on a normal desk or bench which should be of sturdy construction and of sufficient size to accommodate the computer base unit. There should be at least 30mm clearance from any obstruction to allow the circulation of air through the cooling vents. Ensure there is ample space at the rear of the base unit for cables.

The Data Station should be operated in a room with an atmosphere free from dust and corrosive vapours.

4.3 Using Your Own Computer

If required, you may use your own computer providing it has the following minimum specification:

XT/AT compatible 83/102-key keyboard
MS–DOS 3.21 or later
Hard disk – 20 Mbyte (minimum)

Single floppy disk drive:
5.25 inch, 1.2Mbyte or
3.5 inch, 1.44 Mbyte
Mathematics co-processor as follows:
PC AT or compatible – 80287
PC XT or compatible – 8087
640 kbytes RAM
LPT1 parallel port
COM1 and COM2 serial ports
EGA colour board and monitor
Microsoft bus mouse version 7 or later (optional)

For details of installing the SWIFT–IR software on your own computer, refer to Section 13 of the Software Operating Manual

4.4 Unpacking and Interconnnections

4.4.1 Procedure

Before connecting the computer to a mains socket outlet, refer to Section 4.5. Also refer to the computer manual for interconnection details and Section 7, Fig 7.1 for the computer interconnection diagram.

(a) Unpack the computer base unit where the computer is to be used. Position the unit to enable access to the rear for fitting connecting cables.

(b) Unpack the monitor and place on top of the base unit.

(c) Connect the monitor to the mains outlet on the rear of the base unit using the power lead supplied.

Note: Dependent on the computer supplied, the monitor may need to be connected directly to a mains outlet socket (see Section 7).

(d) Fit the video cable between the video connectors (9 pin 'D' type or 15 pin mini-'D' type connector) on the base unit and the monitor.

(e) Unpack the keyboard and place it in front of and close to the base unit.

(f) Connect the keyboard to the rear of the computer base unit.

(g) Unpack the mouse and connect to its mating connector on the rear of the computer base unit.

4.4.2 Floppy Disk Drives

During transit, the computer floppy disk drive is fitted with a cardboard blank. This is essential to reduce the risk of damage to the drive during shipment. Remove the blank before switching on the computer but ensure the blank is retained for future use should it be necessary to move the computer (see Section 4.7). If the cardboard blank is not available, fit an unformatted floppy disk or a known faulty disk.

4.5 Connection to the Mains

4.5.1 Earthing (Grounding)

Before making any connections, the computer must be connected to a protective earth conductor via the three core mains cable supplied. The mains connector must only be inserted into a mains outlet provided with a protective earth contact. This must not be negated by the use of an extension lead without a protective earth contact.

WARNING: Any interruption of the protective conductor either inside or outside the instrument is likely to make the instrument dangerous. Deliberate interruption of the earth conductor is prohibited.

4.5.2 Mains Voltage Setting

Check that your computer is suitable for the mains supply it is to be used on. It is not possible to alter the mains voltage setting of the computer.

4.5.3 Mains Cable Connection

If you have been supplied with a mains cable with no plug fitted, or if the fitted plug is unsuitable, refer to operation (a) and connect a suitable plug. When fitted, carry out operations (b) and (c). If the mains cable has been supplied with a suitable plug fitted, carry out operations (b) and (c).

(a) Fit a suitable 3-pin plug to the free end of the cable, connecting the individual leads as follows:

Plug pins	**Europe**	**N.America**
Live (L)	Brown	Black
Neutral (N)	Blue	White
Earth/Ground (E)	Green/Yellow	Green

A good earth is essential both for satisfactory operation of the instrument and the safety of the user.

(b) Make sure the computer ON/OFF switch is in the OFF position and plug the mains cable into the mains socket at the rear of the computer.

(c) Provided all installation work has been done as detailed in Section 4.3.1, insert the cable mains plug into a mains outlet provided with a protective earth contact.

4.6 Mouse PCB Settings

Where a mouse is used there are some jumpers on the PCB which must be set. The positions of the appropriate jumpers are shown on Fig 4.1. The jumper positions required are as follows:

Jumper J2:	NORMAL
Jumper J3	PRI INPORT
Jumper J4	INTERRUPT NUMBER 5

Note: It is not possible to use a mouse with an XT computer.

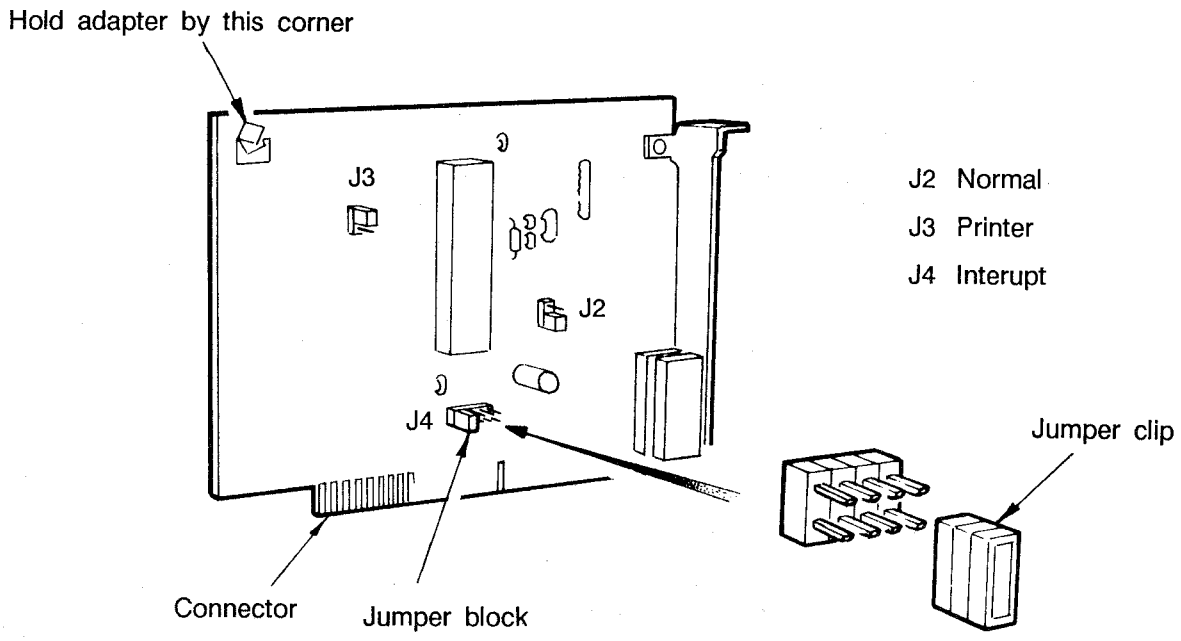


Fig 4.1 Mouse PCB Jumper Locations

4.7 Moving the Computer

Since some computers incorporate a hard disk unit, the computer must **not** be moved or opened whilst it is switched on otherwise the hard disk read/write heads could 'crash' on to the hard disk causing serious damage. Dependent on the computer supplied, the MS–DOS Operating System may include a PARK (or SHUTDOWN) command which must be used before the computer is moved. Refer to the MS–DOS handbook supplied with the computer for details of parking the hard disk read/write heads.

Note: Some computers park the hard disk read/write heads automatically when the computer is switched off. Check your MS–DOS handbook for further details.

Immediately before moving the computer, remove any disk that may be in the floppy disk drive and insert the cardboard blank (see Section 4.3.2). If the cardboard blank is not available, insert an unformatted disk or a known faulty disk to protect the floppy disk drive against possible transit damage.

4.8 Computer Consumables

The following computer floppy disks are available from your Philips Service Organisation (or Agent):

Item	**Part number**
Blank floppy disks, boxes of ten:	
5.25 inch, high density floppy disks	9423 299 40701
3.5 inch, high density floppy disks	9423 299 40711

SECTION 5 – PRINTER INSTALLATION

5.1 Introduction

Four different printers may be used each being supplied with its own manual which should be consulted for full instructions on setting up and operation. This Section gives specific details concerning the installation of a printer for use with a Philips PU9600 FTIR Spectrometer.

The printers supported are as follows:

- Epson dot matrix printer (FX800 or FX850)(Local Control and Data Station)
- Hewlett Packard HP Paintjet 3630A printer (Local Control only)
- Hewlett Packard HP Laserjet II laser printer (Local Control and Data Station)

Depending on the version of PU9600 supplied, the printer may be fitted with both a parallel and serial connector. The serial connector consists of two horizontal rows of pins, 13 on the top and 12 on the bottom. The parallel connector is a 36 way connector having 18 connecting pins in each row. Only an appropriate mating connector can be fitted to either connector.

Local Control version
For use with a Local Control version the printer must have a serial interface for connecting it directly to the Optical Bench. This involves setting the value of a number of parameters by means of switches on the serial interface p.c.b. The serial parameters required are shown in Table 5.1. Ensure the DIP switches on the main p.c.b. of the Epson FX800 and FX850 printers are set as indicated in Fig 5.1(a).

The HP Laserjet II laser printer has both a parallel and serial interface as standard. For use with a Local Control version the serial interface is selected via the printer control panel and the serial parameters listed in Table 5.1 set as described in the printer manual.

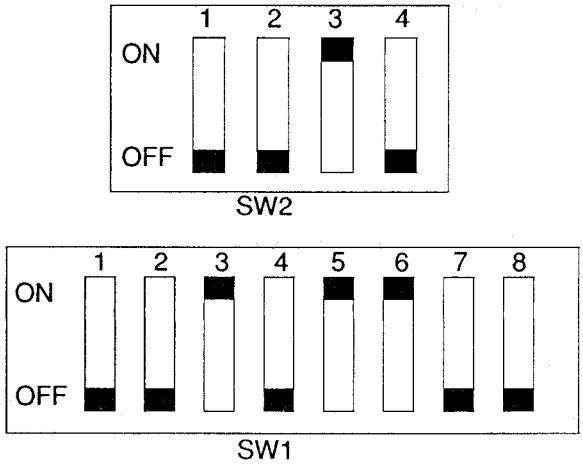
Data Station version
For use with a Data Station version the printer parallel interface connects directly to the parallel interface connector (LPT1) on the computer base unit. Ensure the switches on the main p.c.b. of the Epson FX800 and FX850 printers are set as indicated in Fig 5.1(b).

Notes:
1: The Hewlett Packard HP Paintjet 3630A printer is not supported for use with a Data Station system.
2: You can use an Epson printer fitted with a serial interface by setting Switch 2-1 on the serial interface p.c.b. to ON.

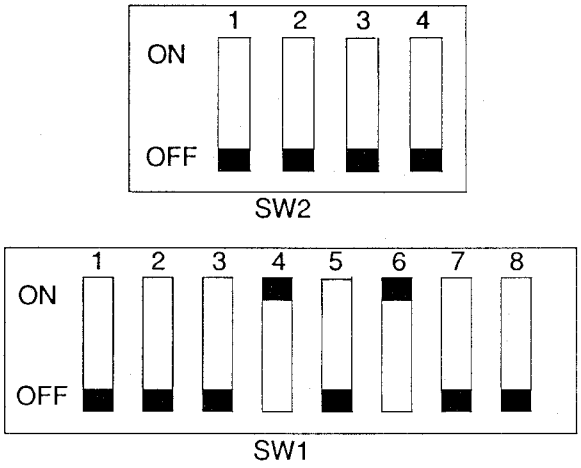
5.2 Initial Inspection

Check the contents of the shipment against the delivery note received with the equipment for completeness and possible transport damage.

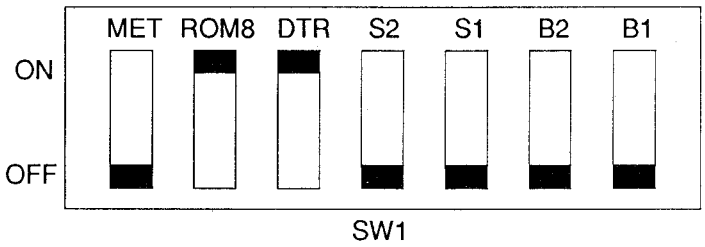
If the contents are incomplete or damaged, a claim should be filed with the carrier immediately. The nearest Philips Analytical Sales Organisation (or Agents)



(a) Epson FX800/FX850 printer DIP switch settings (Local Control only)



(b) Epson FX800/FX850 printer DIP switch settings (Data Station only)



(c) HP Paintjet 3630A printer DIP switch settings (Local Control only)

Fig 5.1 Printer DIP switch settings

should also be notified of any damage and/or items not supplied in order to facilitate repair or replacement.

5.3 Setting of DIP Switches

With the exception of the HP Laserjet II, each printer has some Dual In-line Package (DIP) switches that must be set. The number of switches and the settings required depend on the printer but are normally set before despach. However, this should be checked by referring to the appropriate printer manual for the switch locations and Figs 5.1, 5.2 and Tables 5.1, 5.2 of this Section for the appropriate settings. To use an Epson printer with a Local Control version, various jumpers etc. must also be set (see Table 5.2).

Data Station version
To use an Epson printer with a Data Station version, ensure the DIP switches on the main p.c.b. of the Epson FX800 and FX850 printers are set as indicated in Fig 5.1(b).

Local Control version
To use a dot matrix printer with a Local Control version, the printer must have a serial interface fitted and the serial parameters required set on the DIP switches located on the serial interface p.c.b. Details of the serial interface switch positions for the Epson printers are shown in Fig 5.2. For further details, refer to the printer manual. The serial parameters required are given in Table 5.1. Ensure the printer switches on the main p.c.b. of Epson FX800 and FX850 printers are set as indicated in Fig 5.1(a).

Note: Since the HP Laserjet II has no DIP switches, the serial parameters must be entered from the printer control panel. For details of setting up the printer serial parameters, refer to the HP Laserjet II manual.

On the Epson printers there are also a number of other settings such as jumpers that must be made on the serial interface p.c.b. The settings required are listed in Table 5.2 (refer to the printer manual for the position of the jumpers etc.).

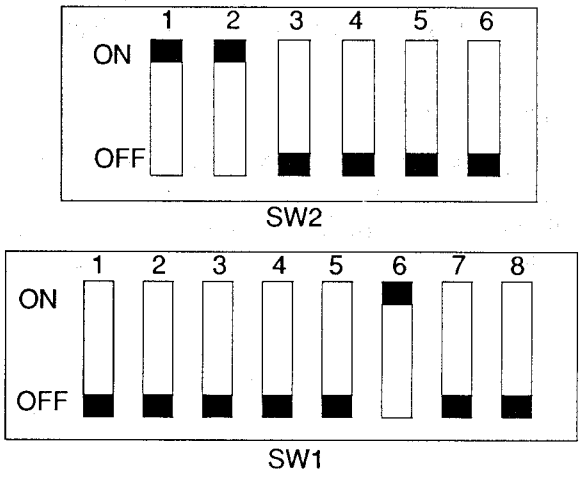


Fig 5.2 Epson printer serial interface DIP switch settings

Table 5.1 Printer Serial Parameters

Epson and HP Paintjet		HP Laserjet II	
Baud rate:	9600	I/P-O/P PORT:	Serial
Parity:	None	BAUD RATE:	9600
Data:	8 bits	ROBUST XON:	Off
Stop bit:	1 bit	DTR POLARITY:	High

Table 5.3 Epson Serial Interface Jumper Settings

Jumper	Setting	Jumper	Setting
J1 to 4:	Off	JX:	Off
J5:	On	JF:	On
J6:	Off	JCL:	Off
J8A:	On	JRS:	On
J8B:	Off		

5.4 Printer Connection

5.4.1 Connection to the Computer

Where a Data Station version is received, the printer is supplied with a cable assembly to connect it to the Data Station base unit. At one end of the cable is a 25-way 'D' type plug. Fit this into the PARALLEL 1 (LPT1) socket of the computer drawing the plug carefully into the socket by tightening each jackscrew alternately, a turn at a time. Connect the 36-way plug at the other end of the cable to the mating socket on the printer. Secure in position using the clips on the printer.

5.4.2 Connection to the Optical Bench

If a Local Control version has been supplied, the printer requires a serial interface adapter. This connects directly to the 25-way serial connector on the rear of the Optical Bench using one of the cables supplied with the instrument. However, the printer used must be selected as described in Section 3.

5.4.3 Using Your Own Printer

If you are supplying you own printer, you need to acquire a suitable cable to connect it to the instrument. The cable should be a null modem serial interface cable with a 25 way D type female connector for connection to the instrument. The connections to the 9 or 25 way printer connector should be as listed in Table 5.4.

Table 5.4 Printer cable

Instrument	Signal	Printer		
25 way pin/signal	direction	9 way pin	25 way pin	Signal
3 / TXD	out	3	2	RXD
2 / RXD	in	2	3	TXD
4 / RTS	out	6 & 1	6 & 8	DSR & DCD
6 & 8 / DSR/ DCD	in	7	4	RTS
20 / DTR	out	8	5	CTS
5 / CTS	in	4	20	DTR
7 / GND		5	7	GND
Screen				Screen

5.5 Connection to Mains

5.5.1 Earthing (Grounding)

Before any other connection is made, the printer must be connected to a protective earth conductor via the three-core mains cable (see Section 5.5.3). The mains plug must only be inserted into a socket outlet provided with a protective earth contact. This protective action must not be negated by the use of an extension cable without a protective conductor.

WARNING: Any interruption of the protective conductor either inside or outside the instrument is likely to make the instrument dangerous. Deliberate interruption of the earth connection is prohibited.

5.5.2 Mains Voltage Setting

The printer is available in 240V, 220V or 110V versions. Check that your printer is suitable for the local mains supply. It is not possible for the user to alter the mains voltage setting.

5.5.3 Mains Cable Connection

If you have been supplied with a mains cable with no plug fitted, or if the fitted plug is unsuitable, refer to operation (a) and connect a suitable plug. When fitted, carry operations (b) and (c). If the mains cable has been supplied with a suitable plug fitted, carry out operations (b) and (c).

(a) Fit a suitable 3-pin plug to the free end of the cable, connecting individual leads as follows:

Plug pins	Europe	N.America
Live (L)	Brown	Black
Neutral (N)	Blue	White
Earth/Ground (E)	Green/Yellow	Green

A good earth is essential both for satisfactory operation of the printer and the safety of the user.

(b) Make sure the Power ON/OFF switch is in the OFF position. Plug the mains cable into the POWER socket at the rear of the printer.

(c) Provided all installation work has been done as detailed in the this section and in the printer manual, insert the mains plug into a socket outlet provided with a protective earth contact.

5.6 Loading Consumables

Your attention is drawn to the sections in the printer manuals detailing the replacement of consumables. If the printer is an HP Laserjet II, particular attention should be paid to this since a drum inside the printer requires periodic replacement. The instructions must be followed precisely to ensure correct operation of the printer.

When using single sheet paper:

- Ensure the paper feed tray is correctly fitted.
- Feed only one sheet of paper at a time into the paper feed tray.
- Wait until one sheet is printed before feeding in the next.
- Remove printed sheets immediately.
- Make sure the paper rest is fitted to the rear of the printer otherwise the paper will catch on cables and connectors at the rear of the printer.

When loading continuous paper in conjunction with a tractor feed unit, make sure that the feed wheels are set the correct distance apart and that the paper release lever on the left hand side is pulled forward.

5.7 Consumables

The following printer consumable items are available from your Philips Service Organisation (or Agent):

Item	**Part number**
Printer paper (box), continuous	9423 299 40501
Ribbon cartridge (Epson FX800/FX850)	9423 299 40801

SECTION 6 – PLOTTER INSTALLATION

6.1 Introduction

Two different plotters may be used each being supplied with its own manual which should be consulted for full instructions on setting up and operation. This Section gives specific details concerning the installation of a plotter for use with the PU9600 FTIR Spectrometer.

The plotters supported are as follows:

- Philips PPG3160/10 colour plotter (for Data Station version only)
- Hewlett Packard Colorpro 7440A plotter

There are two possible configurations depending on the version of PU9600 supplied. If a Local Control version has been supplied, the plotter connects directly to the Optical Bench; where a Data Station version is supplied, the plotter connects to the computer. Whatever configuration is supplied, the plotter uses a serial link.

6.2 Initial Inspection

Check the contents of the shipment against the delivery note received with the equipment for completeness and possible transport damage.

If the contents are incomplete or damaged, a claim should be filed with the carrier immediately. The nearest Philips Analytical Sales Organisation (or Agents) should also be notified of any damage and/or items not supplied in order to facilitate repair or replacement.

6.3 Setting of DIP Switches

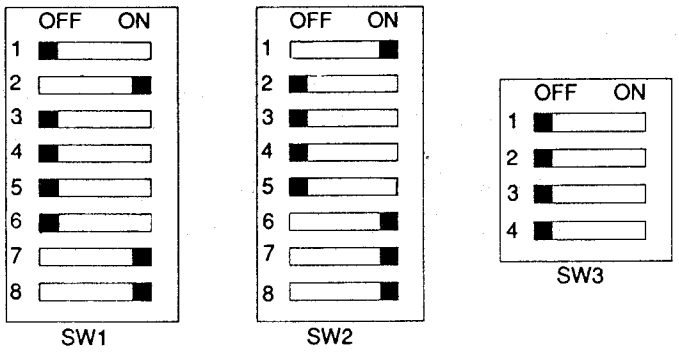
Each plotter has some Dual In-line Package (DIP) switches that must be set. The settings required for the plotter supplied are normally set before despach. However, this should be checked by referring to the plotter manual for the switch locations and Fig 6.1 of this Section for the settings required.

Note: Ensure the correct settings as in Fig 6.1 are made according to the plotter you have received.

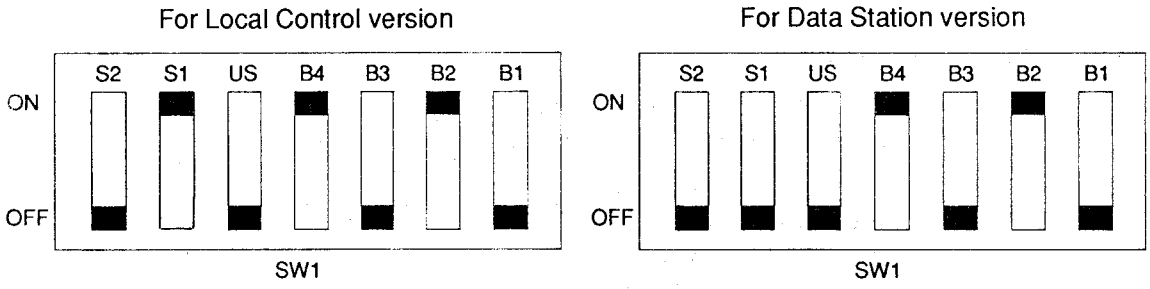
6.4 Plotter Connection

6.4.1 Connection to the Computer

If a Data Station version of the PU9600 has been supplied, the plotter connects to the computer base unit via the cable supplied with the SWIFT–IR software. Connect the plotter to the computer, fitting one end to the plotter connector and the other to serial connector COM2 on the rear of the computer. Draw the connectors carefully into their mating connectors by tightening each jackscrew alternately, a turn at a time. The plotter serial interface parameters must be set as described in Section 7.



(a) Philips PPG3160/10 plotter DIP switch settings



(b) HP Colorpro 7440A plotter DIP switch settings

6.1 Plotter DIP switch settings

6.4.2 Connection to the Optical Bench

If a Local Control version of the PU9600 has been supplied, the plotter connects directly to the 25 way connector on the rear of the Optical Bench using one of the cables supplied with the instrument. The plotter must be selected on the Local Control panel as described in Section 3.8.2.

6.4.3 Using Your Own Plotter

If you are supplying you own plotter, you need to acquire a suitable cable to connect it to the instrument. The cable should be a null modem serial interface cable with a 25 way D type female connector for connection to the instrument. The connections to the 9 or 25 way plotter connector should be as listed in Table 6.1.

Table 6.1 Plotter cable

Instrument	Signal	Plotter		
25 way pin/signal	**direction**	**9 way pin**	**25 way pin**	**Signal**
3 / TXD	out	3	2	RXD
2 / RXD	in	2	3	TXD
4 / RTS	out	6 & 1	6 & 8	DSR & DCD
6 & 8 / DSR/ DCD	in	7	4	RTS
20 / DTR	out	8	5	CTS
5 / CTS	in	4	20	DTR
7 / GND		5	7	GND
Screen				Screen

6.5 Connection to Mains

6.5.1 Earthing (Grounding)

Before any other connection is made, the plotter must be connected to a protective earth conductor via the three-core mains cable (see Section 6.5.3). The mains plug must only be inserted into a mains socket outlet provided with a protective earth contact. This must not be negated by the use of an extension cable without a protective conductor.

WARNING: Any interruption of the protective conductor either inside or outside the plotter is likely to make the instrument dangerous. Deliberate interruption of the earth connection is prohibited.

6.5.2 Mains Voltage Setting

Check that your plotter is suitable for the local mains supply. It is not possible for the user to alter the mains voltage setting.

6.5.3 Mains Cable Connection

If you have been supplied with a mains cable with no plug fitted, or if the fitted plug is unsuitable, refer to operation (a) and connect a suitable plug. When fitted, carry out operations (b) and (c). If the mains cable has been supplied with a suitable plug fitted, carry out operations (b) and (c).

(a) Fit a suitable 3-pin plug to the free end of the cable, connecting individual leads as follows:

Plug pins	**Europe**	**N.America**
Live(L)	Brown	Black
Neutral(N)	Blue	White
Earth/Ground (E)	Green/Yellow	Green

A good earth is essential both for satisfactory operation of the plotter and the safety of the user.

(b) Make sure the plotter ON/OFF switch is in the OFF position. Plug the mains cable into the POWER socket at the rear of the plotter.

(c) Provided all installation work has been done as detailed in the this section and in the plotter manual, insert the mains plug into a socket outlet provided with a protective earth contact.

6.6 Loading Consumables

Your attention is drawn to the sections in the appropriate plotter manual detailing the replacement of consumables. The instructions must be followed precisely to ensure correct operation of the plotter.

6.7 Consumables

The following plotter consumable items are available from your Philips Service Organisation (or Agent):

Item	Part No.
Plotter paper (pack 500 sheets)	9443 099 53041
Pack of five pens (red, green, blue, 2 black)	9442 099 55011
Pack of five pens (yellow, violet, brown, 2 purple)	9443 099 55051

SECTION 7 – SYSTEM INTERCONNECTIONS

7.1 General

This section covers the complete PU9600 system interconnections. Figures 7.1 and 7.2 provide diagrammatic representations of the interconnections required for the installation of each version of the PU9600. For a Data Station version, reference should also be made to Section 4 and the computer handbooks for further details of the computer interconnections. Before making any connections to the computer, ensure there is sufficient access at the rear of the base unit to fit all cables.

Before completing the system installation, the final installation/setting up, for either version, must be completed as described in Section 7.3.

7.2 Interconnections

On the Data Station version, the printer supplied must be connected to parallel interface connector 1 (LPT1) whilst a plotter must be connected to serial interface connector (COM2).

On the Local Control version, only one device can be connected. The device must therefore be fitted with a serial interface adapter.

Five devices may be used to obtain a hard copy output.

The devices are:

- Printers – Epson FX800 or FX850 Dot Matrix Printer
  HP Paintjet 3630A Printer
  HP Laserjet II Laser Printer
- Plotter – HP7440A Plotter

A summary of connections for each version can be found in Section 7.2.3.

7.2.1 Data Station Version

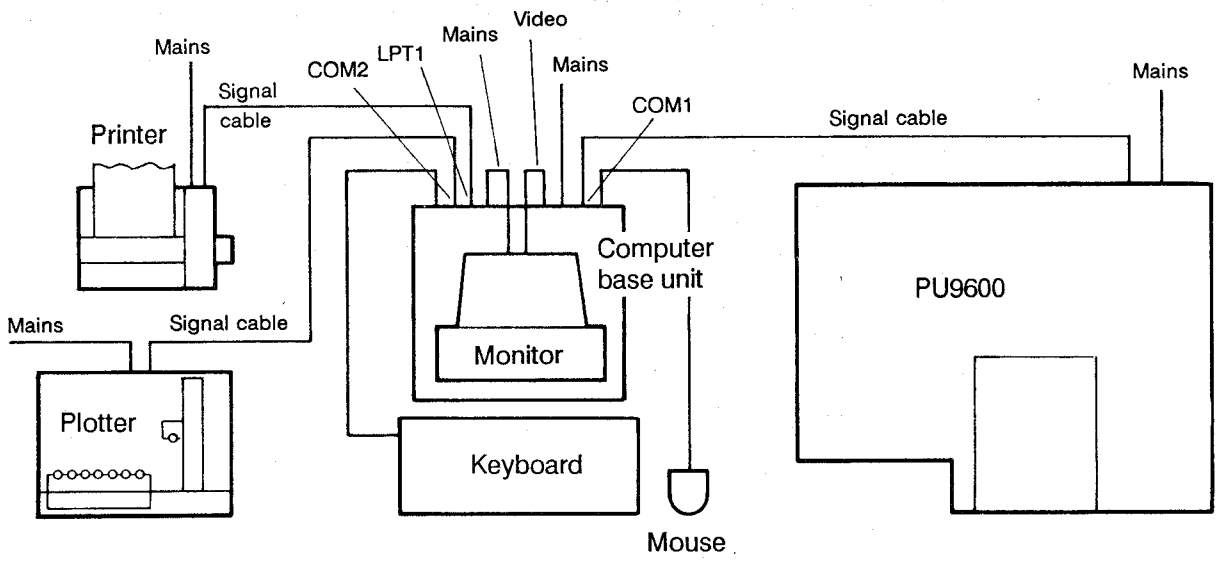
Computer

Using the cable supplied with the SWIFT–IR software, connect the PU9600 to the computer as shown on Fig 7.1. If necessary, use the 25/9 way reducer to connect the cable to the computer.

Ensure the connectors are firmly secured to their respective mating connectors by tightening the jackscrews evenly on each side.

Connect the three pin monitor power lead between the power input connector on the monitor and the associated power output socket on the rear of the base unit. If there is no power output for connecting to the monitor, connect the monitor to a suitable mains outlet socket.

Note: The mains source for the monitor depends on the computer received.



7.1 Data Station Version Interconnections

Fit the monitor signal cable between the video connectors on the base unit and the monitor. Dependent on the computer, these connectors may be either 9 pin 'D' type or 15 way mini 'D' type connectors

Connect the keyboard to the mating connector at the rear of the computer base unit.

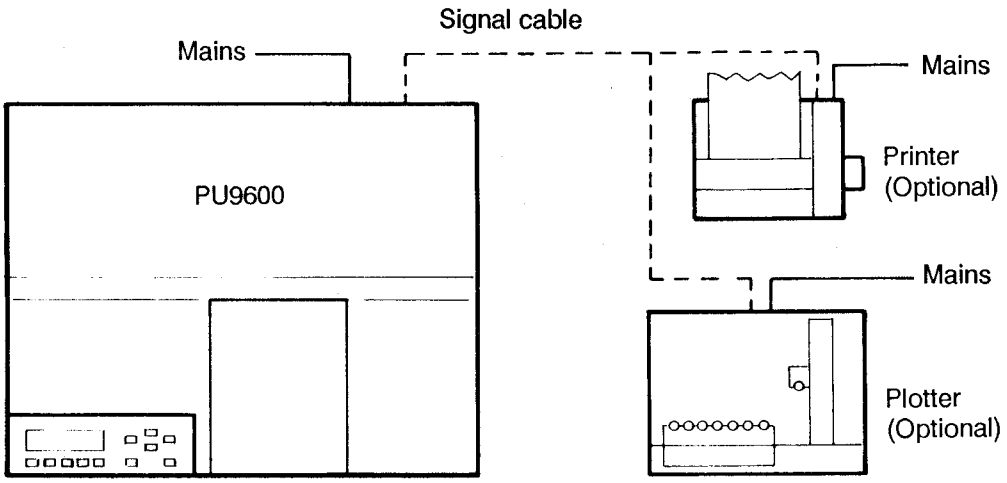
Connect the mouse to its mating connector at the rear of the computer.

Printer
If required, connect the printer supplied to parallel interface connector LPT1on the rear of the computer base unit using the cable supplied with the printer. Ensure that the cable connectors are firmly secured to their appropriate mating connectors at both ends of the cable.

Plotter
If required, connect the plotter to serial interface connector COM2 on the rear of the computer base unit using the cable supplied with the SWIFT–IR software. Ensure the connectors are firmly secured to their appropriate mating connectors at both ends of the cable.

7.2.2 Local Control Version

Connect the required printer or plotter to the 25-way 'D' type connector at the rear of the Spectrometer. Ensure that the connectors are firmly secured to their appropriate mating connectors at both ends of the cable. No cables are supplied with the Local Controlled instrument. If you supply your own printer, you must supply your own printer cable.



7.2 Local Control Version Interconnections

7.2.3 Interconnection Summary

Data station version

From	To
PU9600	Computer serial port COM1
Plotter	Computer serial port COM2
Printer	Computer parallel port LPT1
Monitor signal connector	Computer monitor connector (13–way)
Mouse	Computer mating connector
Keyboard	Computer keyboard connector

Local control version

From	To
PU9600	Required printer or plotter (serial connector)

Note: To connect any printer or plotter to the Spectrometer, it must be fitted with a serial interface adapter.

SECTION 8 – PU9600 MAINTENANCE

8.1 General Information

The information given in this section covers those items of maintenance which may be safely carried out by the operator. It is recommended that work other than that detailed here be carried out by a Philips Analytical service engineer or authorised agent. Maintenance and servicing information for accessories is given in the relevant accessory manuals.

8.2 Routine Maintenance

8.2.1 General

Very little maintenance is required to keep the spectrometer in good working condition. The interior should be kept as dust-free as possible, the sample compartment kept clean, and any spilt chemicals wiped off immediately. Take care that the sample compartment lid is always properly secured.

8.2.2 Desiccant Replacement

To check the state of the Silica Gel dessicant, open the sample compartment and check the colour of the circular window on the right hand wall. If the colour is blue the desiccant need not be replaced. However, if it is pink or turning pink, the dessicant needs replacing which involves the removal of the top cover.

A replacement pack of Silica Gel desiccant can be obtained from Philips Analytical under Part Number 1313 507 67501.

WARNING: The instrument must be disconnected from all voltage sources before any attempt is made to remove the cover.

(a) Switch off the instrument and remove the mains power connector and serial cable from the appropriate sockets on the rear of the instrument.

(b) Carefully pull the front of the Optical Bench forward so the front overhangs the desk on which it is sited. Using the hexagonal wrench supplied, remove the four cover securing bolts from the underside of the instrument (Fig 8.1).

(c) Turn the instrument around and repeat, removing the three hexagonal bolts securing the rear of the instrument cover to its base (Fig 8.1).

(d) Carefully lift the cover directly upwards and clear of the base.

(e) Remove the desiccant at the front of the instrument and insert a new pack.

(f) Replace the cover and secure with the seven bolts removed during operations (b) and (c). Tighten the bolts only until the sealing gasket is just seen to compress. DO NOT OVER TIGHTEN.

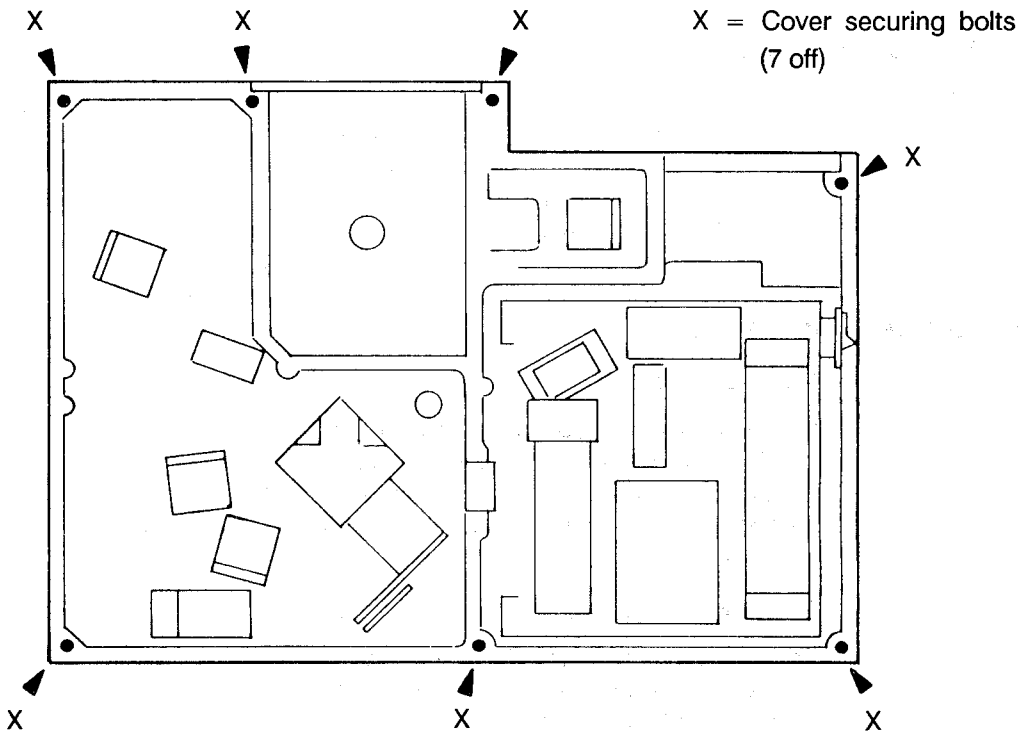


Fig 8.1 Cover removal

8.2.3 Cleaning Exterior of Instrument

Caution: Users should not use cleaning or decontamination methods different to those detailed in Section 8.2.3 without first contacting Philips Analytical to check that the proposed method will not damage the instrument and associated equipment.

The exterior of the instrument should be cleaned periodically as follows:

Caution: Do NOT allow moisture to leak into the instrument.

(a) Switch off the spectrometer and disconnect from the mains.

(b) Using a lint-free cloth dampened with a weak solution of liquid detergent and water, wipe the exterior surface of the instrument as necessary.

(c) Wipe over with a cloth dampened with plain water.

(d) Dry the surface with another cloth.

(e) If finger-marks cannot be removed, rub lightly with a lint-free cloth wetted with isopropyl alcohol.

8.3 Alignment of the Beamsplitter

This procedure is essential for optimum performance. The alignment is first carried out during the initial installation but should also be checked if the instrument performance deteriorates. Alignment is carrried out by accessing the TEST page of the computer or Local Control Panel and using the screwdriver supplied to adjust two screws accessed at the rear of the sample compartment.

When making the adjustments on a Data Station version, an audible indication may be switched on by pressing <F5> SOUND ON/OFF. To turn off the tone, press <F5> a second time. However, this should be used for course adjustment only. Fine adjustment should be done using the PEAK MAX reading on the TEST page.

The procedure for both the Data Station and Local Control versions is basically the same. The only difference is the keys pressed to access the TEST page and to return to the HOME page. The Local Control version has no sound facility.

To set the beamsplitter, proceed as follows:

(a) Switch on the system and allow to warm up for at least 1 hour.

(b) On the Data Station version, if the computer is switched on but the SWIFT–IR software is not loaded:

type: FTIR

and press RETURN (↵).

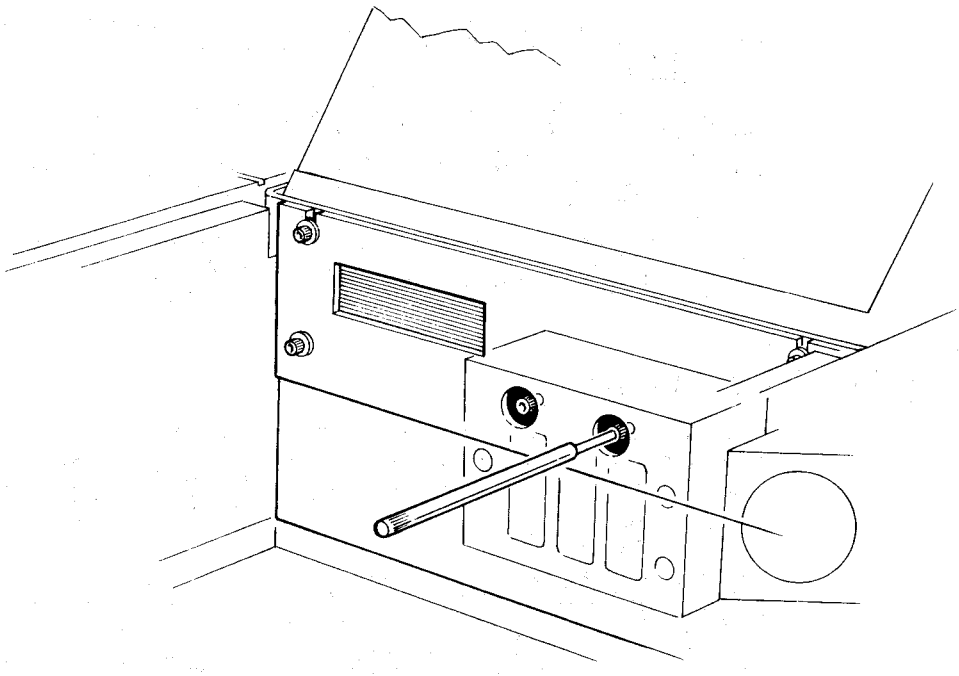


Fig 8.2 Optics adjustment

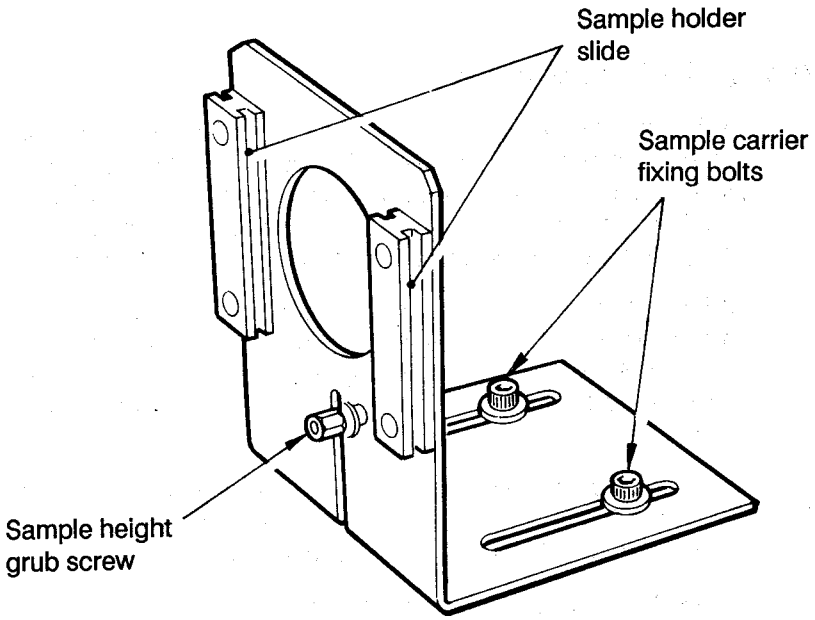


Fig 8.3 Sample carrier alignment

(c) With the HOME page displayed, press the key beneath the TEST legend (<F7> TEST on the Data Station version) to display the TEST page.

(d) Open the sample compartment and remove the two rubber plugs located at the rear.

(e) Using the screwdriver supplied, adjust the screw behind the upper opening (see Fig 8.2) for a maximum PEAK MAX reading on the TEST page.

(f) Repeat (e) by adjusting the screw behind the lower opening for a maximum reading.

(g) Repeat (e) and (f) to obtain the maximum possible reading.

(h) To return to the HOME page, press the key beneath the STOP legend (<F8> (STOP) on the Data Station version).

(j) On completion of the adustments, replace the rubber plugs in the two apertures at the rear of the sample compartment.

8.4 Aligning the Sample Carrier

The following procedure covers the alignment of the standard sample carrier supplied with the instrument. Additional sample carrier accessories as listed in Section 2.5 may be obtained although the alignment of these is covered in the manual supplied with the item.

When making these adjustments on a Data Station version, an audible indication may be switched on by pressing <F5> SOUND ON/OFF. To turn off the tone, press <F5> a second time. However, this should be used for coarse adjustment only. Fine adjustment should be done using the PEAK MAX reading on the TEST page.

The procedure for both the Data Station and Local Control versions is basically the same. The only difference is the keys pressed to access the TEST page and to return to the HOME page. The Local Control version has no sound facility.

To align the sample carrier proceed as follows (see Fig 8.3):

(a) Switch on the system and allow to warm up for at least 1 hour.

(b) On the Data Station version, if the computer is switched on but the SWIFT–IR software is not loaded:

type: FTIR

and press Return (↵).

(c) With the HOME page displayed, press the key beneath the TEST legend (<F7> TEST on the Data Station version) to display the TEST page.

(d) Open the sample compartment and using the tool supplied loosen the two Allen screws securing the sample carrier to the baseplate.

(e) Place the sample to be tested with its holder into the slide on the carrier. Move the sample carrier backwards and forwards along the line of the beam to obtain a maximum PEAK MAX reading on the TEST page. If necessary, the carrier may be rotated slightly although this is unlikely to improve the reading obtained.

(f) When a peak reading is obtained, hold the carrier securely in position and tighten the Allen screws checking that the reading does not change appreciably.

(g) If the beam is slightly above or below the sample aperture hole, the sample height may be adjusted by loosening the grub screw on the carrier (see Fig 8.3) and raising or lowering the sample as necessary. However, this should be unnecessary as the height is factory set according to the beam height before despatch.

(h) To return to the HOME page, press the key beneath the STOP legend (<F8> STOP on the Data Station version).

8.5 Renewal of Fuses

Whilst the mains fuse is located on the rear panel of the instrument, all other fuses are located inside the instrument and are not customer replaceable. If a mains fuse blows repeatedly, this indicates a fault which should be dealt with by a service engineer.

A fuse must always be replaced with one of the correct type and value. Spare fuses are supplied with the Spectrometer.

The instrument mains fuse is located on the rear panel of the instrument on the same panel as the mains connector. Before replacing a fuse, switch off and ensure mains power to the instrument is removed. If fitted, remove the mains cable from its socket on the rear panel. Remove the fuse and renew with a fuse of the same type and rating. The following fuses are suitable for use with the PU9600:

110/115V operation – 3A semi-delay (T)	Part No. 2422 086 01451
230/240V operation –1.6A semi-delay (T)	Part No. 2422 086 01433

Note: To replace mains fuses on the computer (if applicable) and/or printer or plotter, refer to the appropriate manual.

8.6 User Replaceable Parts

There is only one user replaceable part inside the instrument, this being the Silica Gel desiccant; the replacement procedure is described in Section 8.2.2.

A replacement pack of Silica Gel desiccant can be obtained from Philips Analytical under Part Number 1313 507 67501.

8.7 System Consumables

The following system consumable items are available from your Philips Service Organisation (or Agent):

Printer:	
Printer paper (box), continuous	9423 299 40501
Ribbon cartridge (Epson FX800/FX850)	9423 299 40801
Plotter:	
Plotter paper (pack 500 sheets)	9443 099 53041
For Philips PPG3160/10 plotter:	
Pack of six pens (different colours)	9423 185 05061
Pack of six pens (black)	9423 185 05071
Computer:	
Box of 10 blank 5.25 inch disks (1.2Mbyte)	9423 299 40701
Box of 10 blank 3.5 inch disks (1.44Mbyte)	9423 299 40711

SECTION 9 – PERFORMANCE TESTS

9.1 General

These procedures cover the performance tests required to check that the instrument conforms to the published specification.

The following tests require special test equipment:

- Resolution
- Wavenumber accuracy
- Linearity
- Gain accuracy

This equipment is available in a Calibration and Test Kit under Part Number 9423 296 99201

9.2 Precautions

All the tests detailed in this section must be carried out with the cover fitted to the instrument.

WARNING: The instrument contains high voltages and a source of laser energy.
Do not stare directly into the laser beam.
Do not operate the instrument with the cover removed.

9.3 Test Equipment

The following are included in the Calibration and Test Kit. The tests which require each item of test equipment are shown in parentheses.

- HCl gas cell (Resolution – Section 9.4.4, Wavenumber Accuracy – Section 9.4.5)
- Polystyrene sample, 0.003 inch thick (2 x thickness of a polystyrene sample card) (Linearity – Section 9.4.7)
- Aperture, Pinhole, 400 micron diameter (Pinhole Transmittance – Section 9.4.8)

9.4 Instrument Performance Tests

9.4.1 General

To conduct the tests, you need a working system, complete with a printer/plotter and Data Station (a Local Control Version of the instrument cannot be used to conduct the tests). You must be fully familiar with the system operating procedures.

The tests described in the following Sections refer to the test methods at the end of this Section.

9.4.2 Short Term Stability

(a) Switch on the instrument and allow it to stabilise for a period of 20 minutes.

(b) Using Test Method STAB, measure the 100%T baseline. This is a 1 minute (44 scans) background scan at 4 cm^{-1} resolution, followed immediately by a 1 minute (44 scans) sample scan at 4 cm^{-1} resolution with Normal (Happ-Genzel) Apodisation.

(c) Check that, over the wavenumber range 5000 cm^{-1} to 400 cm^{-1}, the 100%T baseline does not differ from 100%T by more than±1%T.

(d) Finally check that, over the full wavenumber range 6000 cm^{-1} to 400 cm^{-1} (or 6000 cm^{-1} to 200 cm^{-1} for extended range versions), the 100%T baseline does not vary by more than±2%T.

9.4.3 Long Term Stability

For this test, the temperature of the servicing area must be controlled to within±1°C.

(a) Switch on the instrument and allow it to stabilise for 12 hours.

(b) Using Test Method STAB, measure the 100%T baseline. This is a one minute (44 scans) background scan at 4 cm^{-1} resolution, followed one hour later by a one minute (44 scans) sample scan at 4 cm^{-1} resolution, with Normal (Happ-Genzel) Apodisation.

(c) Check that, over the wavenumber range 5000 cm^{-1} to 400 cm^{-1}, the 100%T baseline does not differ from 100%T by more than±1.5%T.

9.4.4 Resolution

The Calibration and Test Kit will be needed for this test.

(a) Introduce into the sample compartment the HCl gas cell at a pressure to give an Absorbance of between 0.1A and 0.2A.

(b) Using Test Method RES, measure the resolution at 2 cm^{-1} for the peak at 3031 cm^{-1}. This method uses 10 scans for background and sample with High Resolution (Boxcar) Apodisation and three interpolations.

(c) Check that the Full Width at Half-peak Height (FWHH) for the peak measured in Absorbance is less than 1.5 cm^{-1}.

9.4.5 Wavenumber Accuracy

The Calibration and Test Kit is needed for this test.

(a) Introduce into the sample compartment the HCl gas cell at a pressure to give an Absorbance of between 0.1A and 0.2A.

(b) Using Test Method RES, measure the wavenumber accuracy at 2 cm^{-1} resolution with High Resolution (Boxcar) Apodisation, using 40 scans for background and sample with High Resolution (Boxcar) Apodisation and 4 interpolations.

(c) Check that the HCl peak at 2727.78 cm^{-1} is accurate to ±0.1 cm^{-1}.

9.4.6 Noise

Using Test Method NOISETST, measure the noise on the 100%T baseline for a 1 minute sample scan (44 scans) at 4 cm^{-1} resolution with Normal (Happ-Genzel) Apodisation. Noise over the range 2200 to 2100 cm^{-1} should be less then 0.033%T, giving an equivalent signal/noise value of 3000:1.

9.4.7 Linearity

For this test a 0.003 inch thick polystyrene sample from the Calibration and Test Kit is required. Alternatively, two thicknesses of the sample supplied can be used.

(a) Using Test Method ZERO, measure the Transmittance at 4 cm^{-1} resolution and 1 minute sample and background scans (44 scans) with Normal (Happ-Genzel) apodisation. This will give a spectrum from 3500 cm^{-1} to 500 cm^{-1} expanded to show the totally absorbing polystyrene peaks.

(b) Check that the peaks have a Transmittance of 0.0%T±0.2%T at wavenumbers 3025, 2929, 1493, 1453, 754 and 704 cm^{-1}.

9.4.8 Pinhole Transmittance

For this test, the 400 micron diameter aperture (pinhole) from the Calibration and Test Kit is required.

(a) Use Test Method PIN, which uses 1 minute background and sample scans (44 scans) at 4 cm^{-1} with Normal (Happ-Genzel) Apodisation over the range 2500 to 1500 cm^{-1}. Check that the aperture Transmittance is at least 0.25%T at 2000 cm^{-1}.

9.4.9 Gain Accuracy

For this test a 2 mm diameter aperture is required.

(a) Use Test Method GAIN to measure the ratio of the Gain settings which are Normal, Medium and High.

(b) Check that the ratios are correct relative to Gain 1 to within ±2%.

Test Method: STAB – Short and Long term Stability

```
Mes Clear beam. Press any key to continue\
pause
Wai 1800

Mes Short term\
high = 6000
low = 400
res = 16
num = 44
apo = normal
gain = normal
mode = single
scan bac
scan sam
sav sam short
opt sam
print

Mes Long term\
high = 5000
low = 400
num = 44
scan bac
wait 3600
scan ref
sav ref long
opt ref
print
```

Test Method: ZERO – Polystyrene Zeroes Linearity Test

```
Mes Clear beam, then press any key\
pause
high = 3500
low = 500
res = 4
num = 44
apo = normal
gain = normal
mode = single
scan bac
Mes insert 2 Nicolet polystyrene cards, press any key\
pause
scan sam
sav sam linear
top = 0.0025
bot = -0.0025
dis sam grid
Mes Record %T values at minima approximately. Press a key when finished.\
pause
grid
```

Test Method: RES – Resolution and Wavenumber Accuracy

```
Mes Wavenumber accuracy\
high = 7900
low = 400
res = 2
num = 20
apo = highres
gain = normal
mode = single
Mes Clear beam, then press any key.\
pause
sca bac
mes Place HCl in beam, then press any key\
pause
sca sam
sav sam hcl

2(int sam 2690 2760)
4(int res 2710 2740) peakpick res 1
mes record wavenumber value, then press any key\
pause
home

mes resolution\
int sam 3000 3060
4(int res 3010 3050)
abs res
dis res 3025 3035
opt res
```

Test Method: PIN – Pinhole Test

```
Mes Clear beam, press any key to continue\
pause
high = 6000
low = 380
res = 16
num = 20
apo = normal
gain = normal
mode = single
scan bac

Mes insert 0.4 mm pinhole in beam, press a key to continue\
pause
gain = high
scan sam sav sam pinhole
dis sam 2010 1990
opt sam
```

Test Method: NOISETST

```
NUM=44
APO=NORM
RES=4
GAIN=NORM
HIGH=7900
LOW=200
SCA BAC
SCA SAM
LIB GENERAL
SAV SAM NFILE1
dos
noise nfile1.irs 4950 5050
pause
noise nfile1 4300 4400
pause
noise nfile1 2100 2200
pause
noise nfile1 500 580
pause
noise nfile1 300 400
pause
ftir
```

Notes:

1: The program NOISE.EXE is in directory C:\LIBRARY\GENERAL.

2: The RMS noise in any spectrum can be calculated by exiting to DOS and typing:

NOISE (filename) (from wavenumber) (to wavenumber)

Test Method: GAIN – Gain Accuracy Test

```
Mes place 2 mm aperture in beam, press a key to continue\
pause
high = 2200
low = 1800
res = 16
num = 10
apo = normal
gain = normal
mode = single
scan bac
scan sam
sav sam gain-n
gain = med
scan sam
sav sam gain-m
gain = high
scan sam
sav sam gain-h
top = 1.04
bot = 0.96
dis fil gain-n 2200 1800
over fil gain-m
over fil gain-h
Mes Read %T at 2000 cm-1 with cursor. Use 'next' to read all 3 spectra.\
```

Index